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STUDIES ON SPIROBOLOID MILLIPEDS. XVIII. *SPELEOSTROPHUS NESIOTES*, THE FIRST KNOWN TROGLOBITIC SPIROBOLOID MILLIPED, FROM BARROW ISLAND, WESTERN AUSTRALIA (DIPLOPODA: PACHYBOLIDAE: TRIGONIULINAE)

by Richard L. Hoffman

ABSTRACT

The new genus and species *Speleostrophus nesiotes* are based on a small series of specimens taken in a cave on Barrow Island, off the northern coast of Western Australia. The complete lack of ocelli and body pigmentation suggests that the animal is an obligate troglobiont, but features of the male genitalia do not differ greatly from the ground plan seen in such genera as *Leptogoniulus* and *Trigoniulus*. The few trigoniulids known to be endemic in Australia are confined to the eastern coast: Queensland and New South Wales.

Owing to their virtual restriction to soil and humus biotopes, millipeds are predisposed to invade underlying cave habitats, and in most calcareous regions of the world have done so on a fairly large scale. Of the major orders of Diplopoda, only the Spirobolida has heretofore included no known species adapted to a strictly spelaean existence. In fact, very few spirobolidans are even recorded as trogloxenes.

That the potential for cavernicoly exists in the order is implied by the Mesamerican taxon Typhlobolellidae, the species of which have lost pigmentation and ocelli simply as edaphobites (the group has not been found in any Middle American cave to date).

It was therefore with the greatest of interest that I could recently examine a series of a trigoniulid milliped taken on Barrow Island, Western Australia, by Dr. W. F. Humphreys of the Western Australian Museum, Perth, and sent by him for identification. Although the appendages of this species are not evidently elongated, pigmentation is reduced and ocelli are missing, strongly suggestive of obligate troglobitic status. Additional biogeographic interest accrues to this discovery in the fact that the nearest known populations of trigoniulids in Australia are restricted to the forested regions of Queensland and New South Wales, one thousand miles to the east. In placing this novel animal on record, it is of interest to remark the relatively unmodified (vis-à-vis the condition in epigaean genera) genitalia of the male sex, perhaps implying a remarkable stability being maintained in these appendages. In general, the

relationships of *Speleostrophus* appear to be with taxa now endemic in the East Indies rather than with the Australian genus *Zygostrophus.*

Family Pachybolidae

This family-group name is employed provisionally pending studies on the relationships of all spirobolidans in which the posterior gonopods are attached to a small horseshoe-shaped sternal remnant.

The original trichotomy into three families Pachybolidae, Trigoniulidae, and Spiromimidae suggested by Brolemann in 1913 is surely an oversimplification, the situation being greatly complicated by the numerous genera described after Brolemann's work. Possibly several families will be recognized, following a thorough revision, and possibly quite different in definition and content from the three nominal subfamilies which I recognized in 1980.

Subfamily Trigoniulinae

As currently conceptualized, this taxon (whether of family or subfamily rank) is endemic in southeast Asia, the East Indies, and the northeastern part of Australia. 21 nominal genera are listed in my 1980 classification, perhaps more than actually exist in nature. All of these species have in common an interesting spherical internal chamber in the coxa of the posterior gonopods. It receives a duct from a gland located dorsad to the gonopods in segment 7, and debouches into a so-called prostatic groove which follows a sinuous course out of the coxa and then fairly direct to the apex of the telopodite, sometimes ending in a cavity, sometimes on a small branch (solenomere). Some trigoniulids have become circumtropically distributed from original habitat somewhere in the East Indies: two notable examples are *Trigoniulus corallinus* (Gervais) (formerly *T. lumbricinus* Gerstaecker) and *Leptogoniulus sorornus* (Butler) (formerly *Spirostrophus naresi* Pocock).

Trigoniulids attain substantial proportions in the Philippines, and especially in New Guinea,where species of *Acanthiulus* reach lengths of over 200 mm. Most are less than 80 mm, however, and many occur in the 20-30 mm length range. The single endemic Australian genus is *Zygostrophus* Chamberlin, 1920 (with the synonym *Prionopeza* Attems, 1953), the five or six nominal species of which are confined to the rainforest regions of Queensland and New South Wales.

Speleostrophus, new genus

Type species: *Speleostrophus nesiotes,* new species.

Diagnosis: A genus of small trigoniulids notable for loss of ocelli and body pigmentation; sternum of posterior gonopods large and elongated.

Name: Greek *sphaelion* (a cave) + *-strophus*, a combining suffix frequently used in this subfamily.

Species: Only the type species is known.

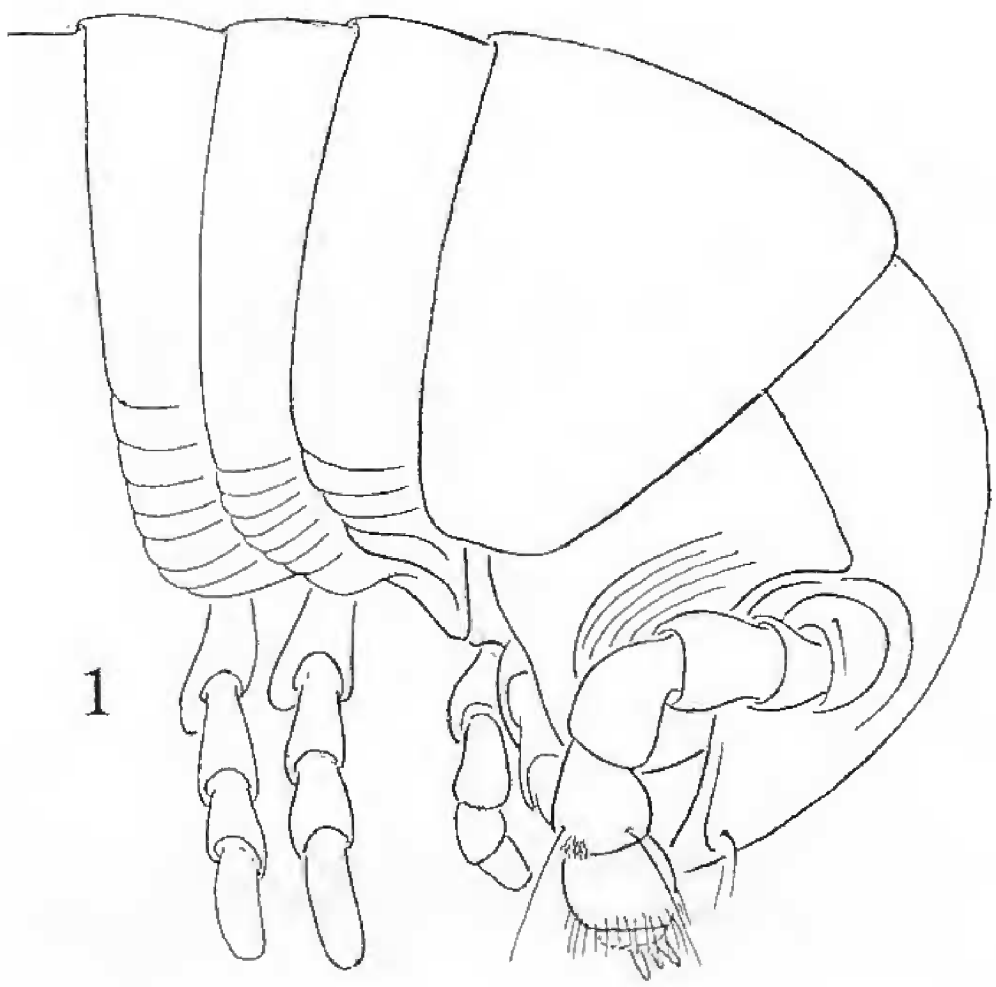
Speleostrophus nesiotes, new species
Figures 1-7

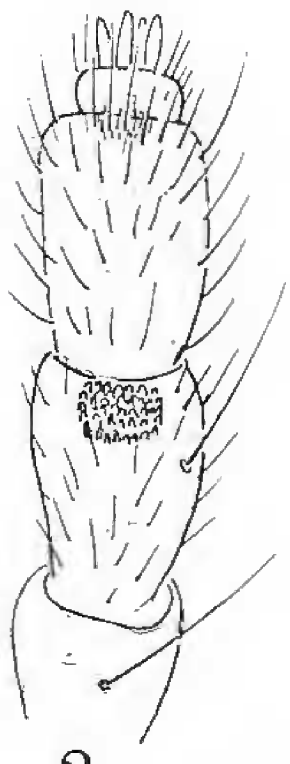
Material: Male holotype (WAM 93/2), male paratype (WAM 93/5), male paratype (VMNH), four female paratypes (WAM 93/3. 93/4, 93/6, 93/7) from Ledge Cave (B1) on Barrow Island (20°48'S, 115°20'E), 160 km NE of Cape Range, Western Australia. Collection 93/2

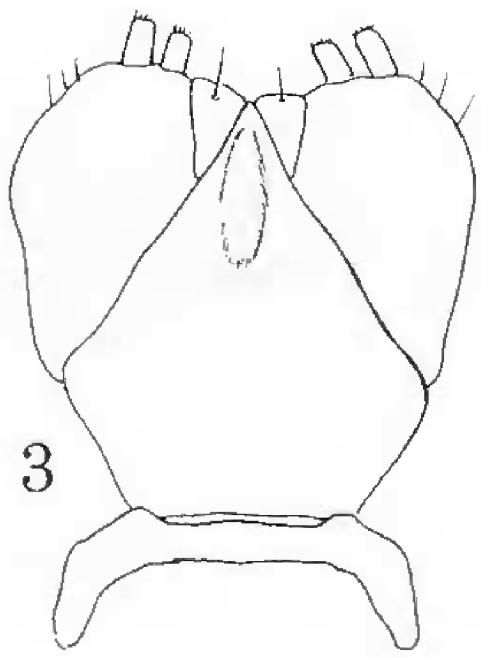
is dated 12 Sept 1991, 93/3, 5 Sept 1991, both W. F. Humphreys & B. Vine leg.; 93/4-93/7 and VMNH all 12 Dec 1991, D. Goodgame leg.

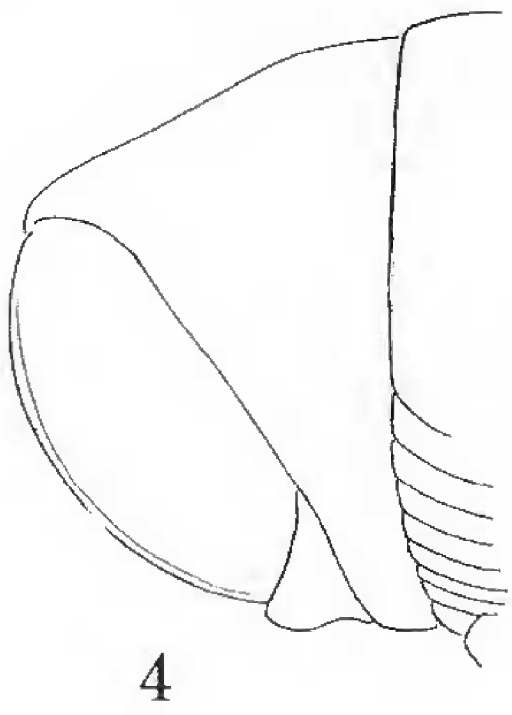
Diagnosis: With the characters of the genus.

Holotype: Adult male, body depigmented, length ca. 28 mm (broken, and fragments curved), diameter 1.6 mm (width), near 1.7 (height); W/L ratio very low, near 6% 40 segments, only the periproctal legless.









Figures 1-4. *Speleostrophus nesiotes* n. sp. Fig. 1. Head and first three body segments, lateral aspect. Fig. 2. Distal antennomeres, much enlarged, showing sensory areas on 5th and 6th. Fig. 3. Gnathochilarium. Fig. 4. Posterior segments, lateral view.

Head (Fig. 1) convex, width across mandibles 1.5 mm, interantennal space 0.7 mm; labrum with single median notch, ca. 5-5 labral setae; 2-2 clypeal setae. Ocelli absent. Antennae relatively slender, apical article with four large sensory cones, outer distal surface of 5th with circular field of microsensillae, 6th with smaller transverse series of similar setae along distal edge (Fig. 2), articles sparsely setose, each with one or two larger socketed setae. Outer face of mandible relatively large, with shallow antennal depression. Gnathochilarium (Fig. 3) of typical spiroboloid form, glabrous except for two or three setae along distal edge of stipes, apical third of mentum medially convex, basal third with shallow transverse depression; mentum widest near midlength, distinctly narrowed proximad.

Collum smooth and polished, lateral ends subtruncate, of the form shown in Fig. 1.

Body segments slightly higher than wide; surface smooth and glabrous, with microscopic texture of isodiametric meshwork. Segmental sutures nearly invisible. Metazona of slightly greater diameter than prozona, increasingly gradually from about midlength of segment; segments only slightly telescoped into those preceding. Ozopores of moderate size and readily visible, located near posterior edge of prozona. Each segment with longitudinal, lateral "belt" at level of pores, surface slightly flattened and with meshwork slightly more conspicuous, continuous for length of segment. Lower sides with ca. 18-20 fine longitudinal striae, becoming larger ventrad. Posteriormost segments as shown in Fig. 4.

Legs relatively long and slender, each podomere with a single apical ventral seta (several setae on anteriormost legs) except tarsi which have one or two accessory hairs near base of claw. Tarsi without ventral pads. Coxae of legs anterior to gonopods elongated and produced into apical truncate lobe (Fig. 5); claws of these legs much larger than those more posteriad.

Pleural elements of segment 7 meeting midventrad to form an unmodified sympleural commissure. Anterior gonopods (Fig. 6) of fairly representative trigoniulid form; sternum prolonged into triangular median process much exceeding apices of coxae; telopodites slender, exceeding apex of sternal process, with uncate apices. Posterior gonopods (Fig. 7) attached to large, elongate, parallel-sided sternal element (Fig. 5, St 9), strikingly different from the small "horseshoe-shaped" sternum typical for the subfamily; coxal region poorly sclerotized, but with distinct basal chamber receiving duct from prostatic gland and adjacent digitiform projection. Coxa and telopodite separated by distinct articulation; telopodite nearly straight, elongate-triangular in shape, with slender, recurved distal projection; prostatic groove terminating at base of smaller subdistal process.

Name: *Nesiotes*, k., "islander".

Remarks: Two structural features which may be autapomorphies of *Speleostrophus* are (1) the field of sensory setae on the 5th antennomere, and (2) the curious "belt" of surface texture running along the segments at the level of, and including, the ozopores. Neither of these details has been noted for other trigoniulines and should be sought for in small species of other genera. The first-mentioned is perhaps associated with cavernicoly and loss of ocelli.

ACKNOWLEDGEMENTS

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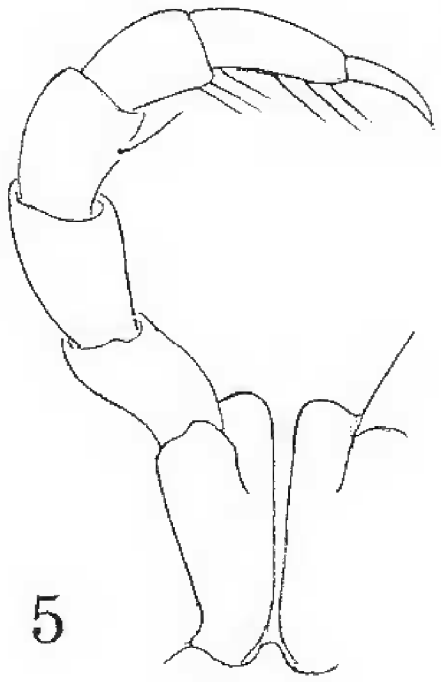

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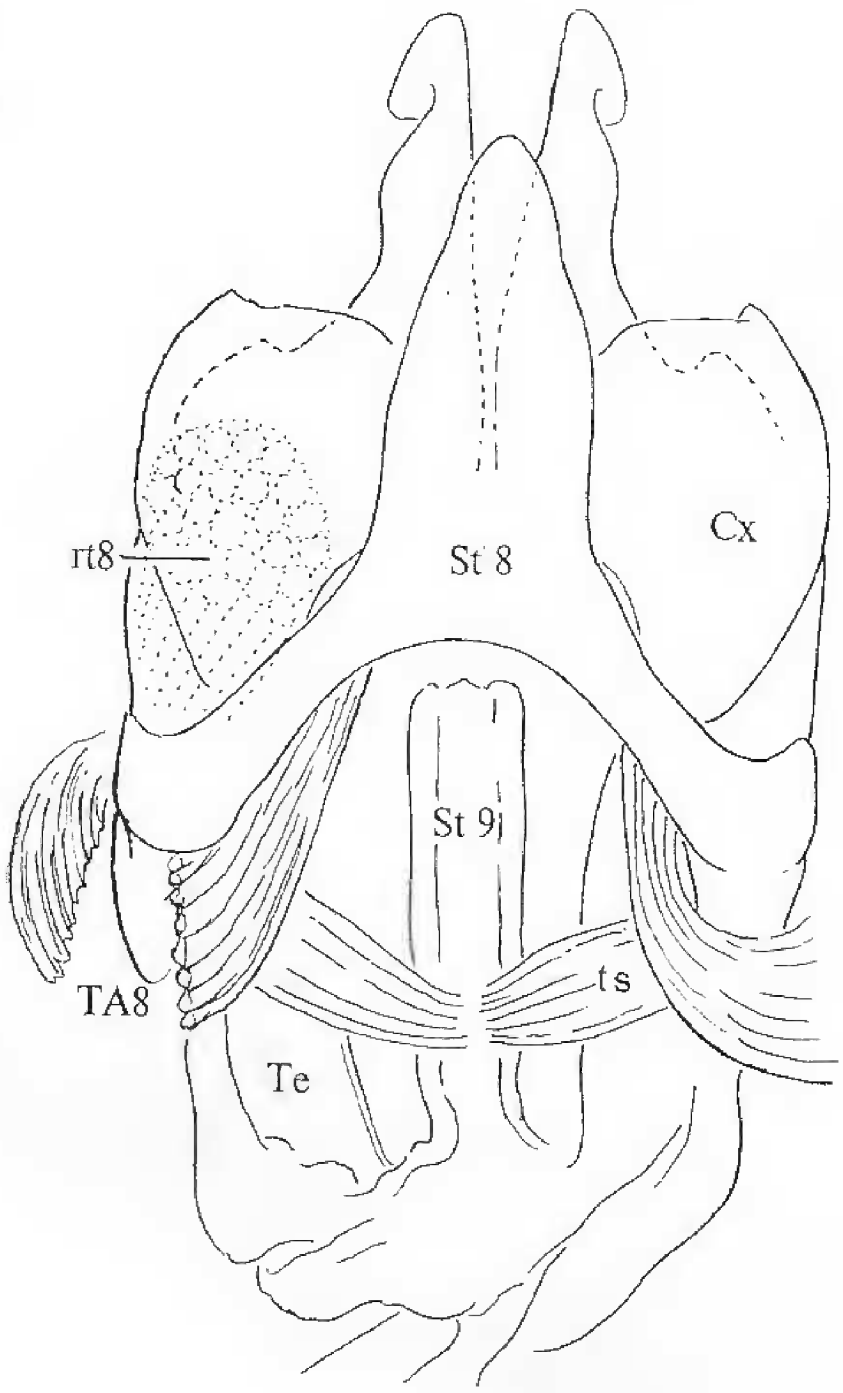

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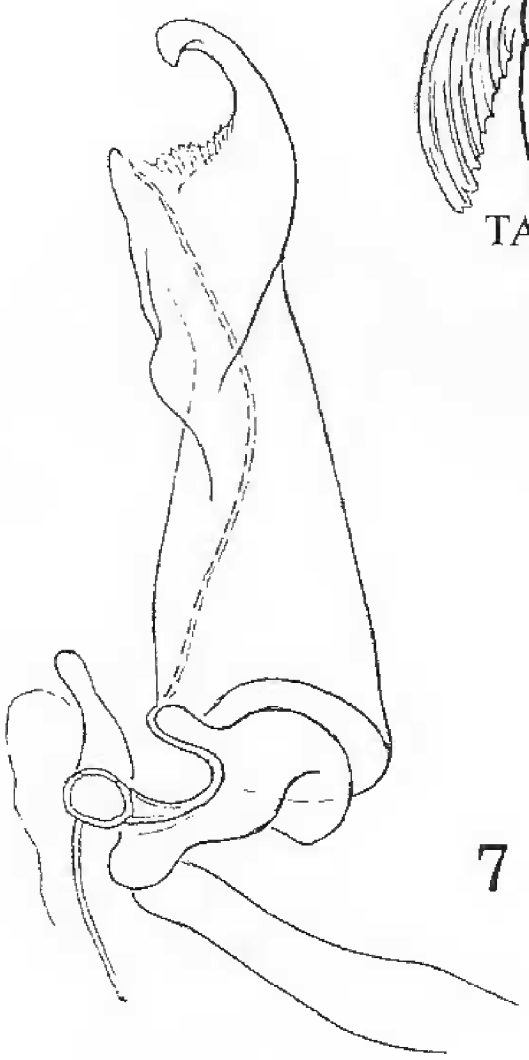

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Figures 5-7. *Speleostrophus nesiotes* n. sp. Fig. 5. Right 3rd leg, anterior aspect. Fig. 6. Gonopods, anterior aspect, the posterior pair displaced dorsad to show shape of sternum but remaining attached to anterior gonopods by the tracheosternal musculature. Fig. 7. Posterior gonopod, lateral aspect. Abbreviations: Cx, coxa; rt8, retractor muscle of gonotelopodite; St8, sternum of anterior gonopods (=8th legs); St9, sternum of posterior gonopods (=9th legs); TA8, tracheal apodeme of anterior gonopods; Te, telopodite of posterior gonopods; ts, tracheosternal muscle of 7th segment.

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